OCT 8 1943

Gas Journal

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Vol. 242. 95th Year. LONDON, SEPTEMBER 15, 1943. No. 4191. Price 1/-

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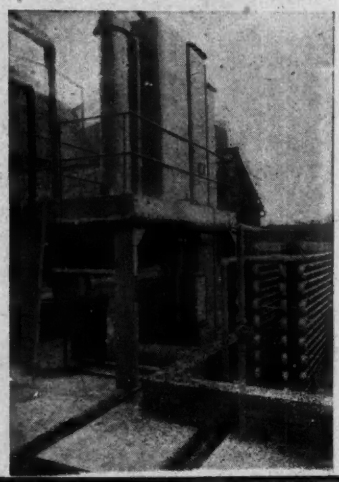

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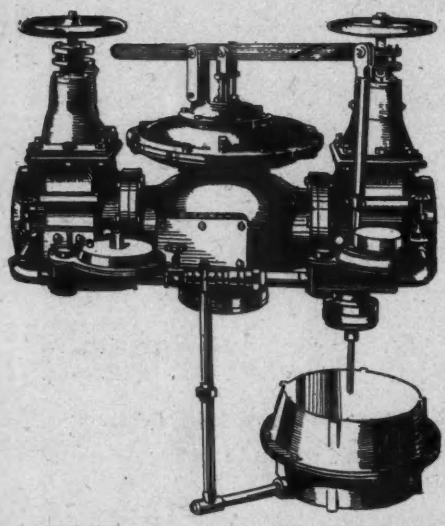

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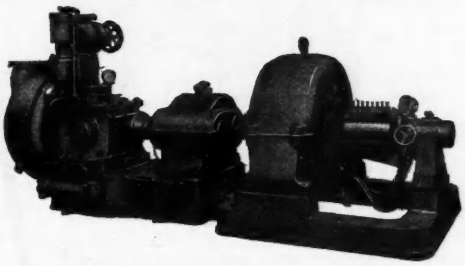

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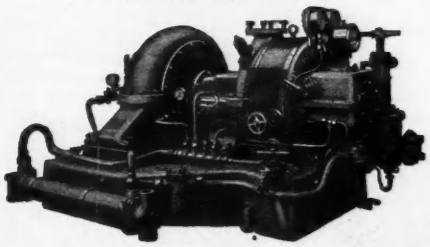

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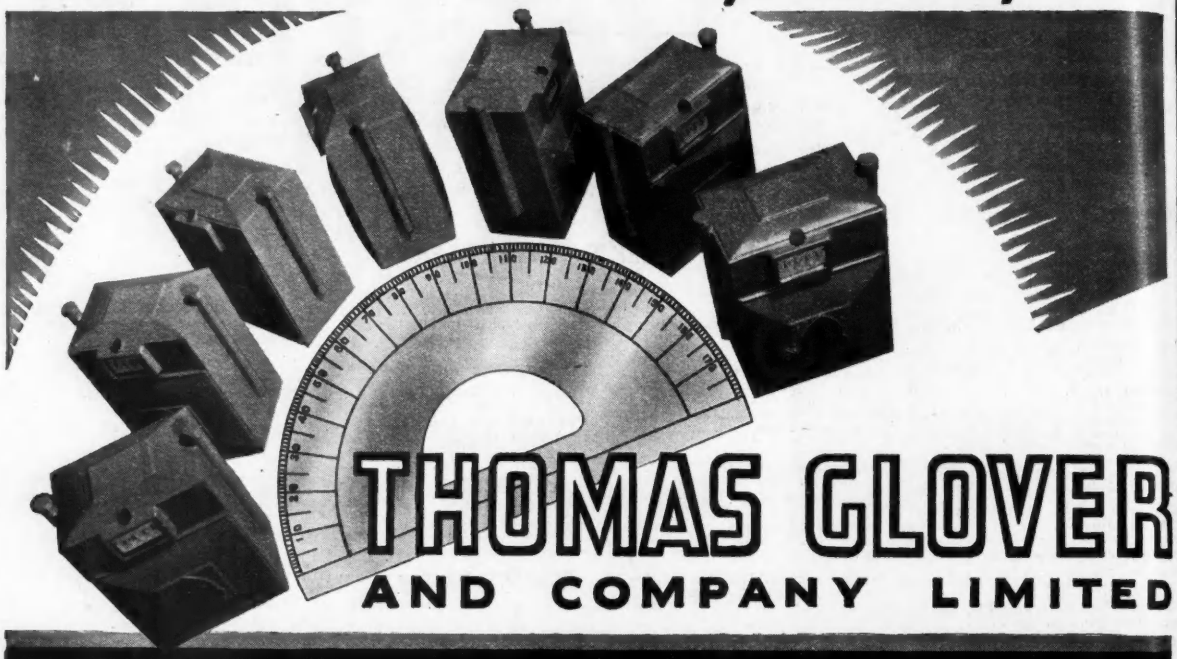

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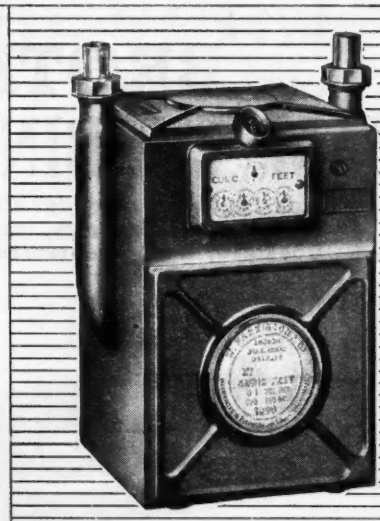

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p. 5

GAS JOURNAL, SEPT. 15, 1943

VOL. 242 95th YEAR No. 4191

EDITORIAL NOTES

KITCHEN RESEARCH

FOR long now all manner of organizations have been busy trying to find out what the housewife wants in her kitchen by way of heat service for cooking and water heating, and there has been much needed concentration on general planning of kitchens from the housewife-convenience angle. It is a question obviously of first interest and first importance to the Gas Industry. It is in the limelight; Government departments, municipal authorities, official organizations keyed-up to provide better housing are seeking guidance on how best to solve the problems involved. Within the Industry investigations have been made, and are in being, co-operatively with the architect to discover practical solutions. It has, in fact, been most encouraging for us within recent months to refer to the serious contributions of certain gas appliance manufacturers in this field of research and investigation. We think that a wealth of information must have been gained which, collated, could be put to useful purpose. So far, efforts within the Industry—excellent as we believe them to be—have been individualistic. They have not, we think, suffered as a result of this individualism; rather the reverse. Correlation by some means or other would, however, seem desirable. It would be good, we have thought for some time, if, by the binding together of experience, a central source of guidance could be established within the Industry, to which housing authorities and the like could have ready access. Certainly the Industry, in such a scheme, would not start *de novo;* the digestion of an ostrich would have to be brought into action.

Though sometimes the sound of the word "planning" becomes a trifle wearisome to our ears, we can only offer welcome to the setting up by the British Commercial Gas Association of an ostrich's digestion. So much work has been done by, for example, the utilization and installations committees of the B.G.F. which should find its expression in planning, including kitchen planning; it must not be wasted. How best to prevent wastage; how best to establish a source of guidance? It seems to us that the B.C.G.A. is doing well to attempt an answer. On a later page we announce the formation of a Domestic Heat Services Committee with these terms of reference: "To give practical application in a co-ordinated manner to the work of the various central committees within the Industry covering all domestic uses of gas and coke, and to guide the advocacy and use of domestic gas and coke appliances in relation to publicity, representations to local authorities or Ministries, and the arranging of model kitchens and exhibits throughout the country." It is a wide programme and will, perhaps, invite criticism. The thought, What! another committee on this time-exhausting planning business, will no doubt occur. But there seems to us to be justification for the setting-up of the Committee, which, it is to be hoped, will in no way damp the ardour and enthusiasm of those who have done and continue to carry out individual research and investigation in the matter. Indeed, we were told in a talk to the Committee last week, its aim is to encourage to the utmost such endeavour and co-ordinate it for the common good—to give the housewife the maximum assistance at minimum cost.

It was only a few weeks ago that we emphasized—not for the first time by any means—that for the Gas Industry to develop to the best advantage there must be co-operation in the domestic sphere with the architect and builder. We have watched the fostering of such co-operation—which is, by the way, of benefit to the architect as well as the domestic gas consumer—with lively satisfaction, and we have referred in these columns to what we may again term "individual" effort. The new B.C.G.A. Committee has, we may mention, retained the services of an architect, and it is hoped that before long there will be "Gas Industry" examples—practical examples in keeping with current trends, likelihood regarding pre-fabrication of dwellings, availability of raw materials, and so on—of the modern heat services which can be provided by gas and coke in the post-war home; and we are glad that coke has not been forgotten. Though we have written, it seems to us sometimes, *ad nauseam*, about planning, we feel that the idea is right that our Industry should be able to present an Industry view on the agreed findings from within the Industry. So we hope there will be no swift clogging of the ostrich's power of digestion of thought-food which, the Committee hopes, will be augmented by suggestions from gas undertakings throughout the land.

As we have said, much has already been done in the matter individually, and it is a happy sign of co-operation that on the B.C.G.A. Committee there should be representatives of firms which have devoted conspicuous and practical effort towards better kitchen planning. In the case of Radiation Limited, whose activities in this direction have been the subject of comment in these columns, the Industry has already available a suggestion in concrete form of a model post-war dwelling. We know that already many gas engineers and local councillors have evinced great interest in the suggestions put forward tentatively by Radiation. It seems to us obviously desirable, however, that the interest should be more widespread, and in arousing this interest among local authorities gas undertakings could do really beneficial work. It cannot be expected that the B.C.G.A. can have ready overnight the series of model kitchens envisaged in its plan; while these kitchens materialize, the excellent co-operative endeavour of Radiation should surely be expanded and enlarged by gas undertakings themselves in concert with local authorities. We understand that Radiation are still generously keeping "open house" to their model house, and that any visits which gas undertakings can organize for their local housing committees or others will receive a cordial welcome in Birmingham.

RETORT HOUSE ECONOMY

IN these times, when the gas engineer's leisure for studying even the literature of his trade is in almost as short supply as the paper for printing that literature, we should like to acknowledge the exemplary co-operation of the Author of one of the North British Association Papers. The admirable abstract, on later pages, of Mr. C. A. Poulson's Paper was, in fact, prepared, parallel with the fuller version given at the meeting, by the Author himself. The preparation of such abstracts is a policy which we have long advocated, unfortunately without conspicuous success. If it can be developed to the extent of becoming general practice, we believe it will immeasurably enhance the value of technical journals in years to come.

The Paper, written by one with exceptional experience of carbonizing plant from the dual angle of design and operation, was literally packed with sound advice on that all-important subject of retort-house economy, the significance of which has been more than ever thrust upon us by the exigencies of war. The Paper, therefore, is most opportune, and those who study it *in toto* will gain much. It is a wartime Paper, but the information in it can be applied with equal advantage under peacetime as well as wartime conditions. The Author says in effect, Take care here, take care there; and he explains how to take care. The cumulative

economy to be gained from following his essentially practical advice on the avoidance of waste is very great, and this applies to works both large and small.

Of course, the Gas Industry is working against considerable odds. Striving to improve carbonizing efficiency it starts right away with a big handicap in the quality of coal supplied to it. Mr. Poulson spoke, for example, of a consignment of Scottish coal having an ash plus moisture content of 25%. Such a handicap is, to say the least, aggravating. For every £1 spent on coal, 5s. is paid for ash and water; works handling costs leap up; carbonizing plant capacity is decreased, and so is producer area; and, of course, the quality of the resultant coke is seriously affected. Reliable figures set out in the Paper show increase in ash content over the past six years of 50%; and prices of coal have practically doubled during that period. The while is the clamant and necessary call for economy. So we grit our teeth; and we think that the economies we have in fact made in wartime will have an astonishingly good result in peacetime if we are supplied with raw material of the right quality, if we are able to purchase to reasonable specification. For we have been taught to think in broad terms, the lay-out of a gas-works as a whole, and in terms of detail—the whole aim being to reduce our fuel consumption in gas manufacture. In which connexion there is no doubt that more technical supervision, accompanied by the intelligent use of more tell-tale instruments, would go a long way to assist the fuel economy drive. In his Paper Mr. Poulson covered the operation of producers, setting control and retort working, care of refractories, waste heat boilers, and the levelling of works steam requirements. The stress laid on this "levelling" appeals to us very much indeed, for almost every piece of plant operates at its highest efficiency when conditions allow a constant load—and our endeavour should be to create such conditions. It is surprising what can be done to level out the steam curve over the 24 hours, to reduce the peaks by adjusting the time-table of the use of intermittent steam plant. We should bear in mind that a therm of steam costs as much to produce as a therm of coal gas.

The hints put forward in profusion by Mr. Poulson need no elaboration on our part; they are thoroughly sound, based on long and intimate carbonizing experience; they are nationally useful at the present juncture, and will not lose their merit on the cessation of war; if not all of what might be termed major import, their cumulative effect, as we have said, is the reverse of insignificant. And the Author's explanation of *how* to take care is simple, direct, and eminently to the point. The care and thought he has himself expended in setting out targets for thermal efficiency at which gas undertakings can aim are apparent, though we would, with the Author, again underline that reasonably regular quality of coal is indispensable to the effort, and that the demand for it is in the economic interests of the nation as well as of the Gas Industry.

ELECTRICAL INDUSTRY RESEARCH

WE have written a good deal lately about research in general, and more particularly about research in our own Industry and on coal. Temporarily to round off the matter, as it were, it is of interest to take a glance at some suggestions regarding research in the electrical industry. The Post-War Planning Committee of the Institution of Electrical Engineers recently adopted, with certain modifications, a report of its research sub-committee, and this incorporates a suggested outline of a British Electrical Research Board—"board," we note, not "association." The proposals of the report are designed to secure the benefits of a co-ordinated policy; and, it is stated, such co-ordination should not be so much to curtail in any way overlapping of research facilities as to increase the total volume of research carried out. Indeed, "duplication of interest is very often a great advantage in its effect on research staffs." The proposals do not contemplate any form of reorganization which would necessarily involve Government control; on the contrary, it is considered that such control may be undesirable. What is wanted, it is urged, is a co-ordinating body, and the view is held that the Electrical Research Association does not secure the desired measure of co-operation between all the interests. As a matter of fact, it covers only about 10% of the electrical research work carried out in this country.

Hence the suggestion of the formation of the Board, the main object of which would be to act as a secretariat, bringing into contact where desirable those working in the same field, fostering co-operation with Government departments. The report formulates a general statement in this direction on broad lines. The Board would consist of scientific representatives of industry and other research bodies maintaining their own research organizations, and the basis of the constitution would be that within the electrical industry every associated concern would agree to disclose its scientific research activities to the Board and, subject in suitable cases to financial consideration, to assist other associated concerns with experience and information. In order not to discourage individual initiative in the early stages of a new discovery or invention the Board might delay transmission of confidential matters, and no action would be taken which would detach a piece of research from the actual body which originated it. As a condition of membership of the Board, constituent organizations would be required to undertake that all their patents would be available for the use of members. The Board, which should have no central research laboratories of its own, would arrange for the carrying out, by a group of laboratories, of selected researches not appropriate to individual laboratories of any of the constituent organizations. The training of research personnel would be another of its functions.

The foregoing is a brief indication of how the electrical industry, through the I.E.E., is thinking on this question of research. Finance, of course, enters into the matter. The greater part of the costs of conducting research would, the report maintains, remain much as at present, but central funds would be required for administration. These funds would not depend on Government finance, but "there is every reason why the Government should . . . promote and pay for special researches at the constituent research establishments."

Personal

Sir RUSSELL BENCRAFT, Chairman of the Southampton Gaslight and Coke Company, recently underwent an operation for the amputation of a leg. His very numerous friends in the Industry will be pleased to know that, despite his advanced age, he is making good progress towards recovery.

* * *

Staff and employees of Darwen Corporation Gas Department have made a presentation to Mr. T. HAWORTH, the Gas Engineer and Manager, who has been appointed to a similar position with the Wigan Corporation.

* * *

On Sept. 9 Mr. GEORGE KEITH, Chairman and Managing Director of Keith Blackman, Ltd., was presented by the directors, staff and workers of the firm with a handsome silver tray and a gold watch-chain to mark the completion by him this month of 50 years' service with the Company.

* * *

Dr. JAMES BRODBECK, who has held the office of Chairman of the Clayton Aniline Company, Ltd., since 1930, has resigned his Chairmanship and also his Directorship, and Mr. FRANK B. COMMON, K.C., of Montreal, Chairman of the Pan-American Trust Company, has been elected Chairman in his place. Mr. A. E. PEAK, Managing Director of the Clayton Aniline Company, Ltd., has been elected Vice-Chairman of the Company.

Obituary

Mr. FRANK HORNBY, Manager and Secretary of the Guisborough Gas Company, died suddenly on Sept. 5, at the age of 39 years. He served his apprenticeship under Mr. T. Hornby at Hessle, and subsequently was Technical Assistant to the Waterford City Gas Company; Assistant Manager to the Normanton Gas Company; Manager and Secretary to the Knowle Gas Company; and Manager to the Annfield Plain Gas Company. For the past three years he had been Manager and Secretary to the Guisborough Gas Company. His two younger brothers are respectively Assistant Managers at Hessle and at Stamford Gas Undertakings.

Letters to the Editor

A New Fuel

DEAR SIR,—Many gas engineers will be interested to know of means of overcoming the trouble of dusty coke breeze when used as a fuel. In our case, the boiler flues are rapidly filled with dusty fuel which blows over from the firegrate, and consequently we had to use coke on our boilers. Recently the problem has been tackled by the Chemical Engineering and Wilton's Patent Furnace Company, Ltd., and although we have not sufficient breeze at Horsham to fire the boilers continuously throughout the week, I realized that the experiments proposed might be of general interest, and decided to take part in the preliminary experiments.

I understand that the method of dealing with the matter is quite novel and that patents have been applied for. Considerable expenditure is being incurred in carrying out experimental work.

At Horsham we obtained a supply of pitch and the machine for melting and raising it to a temperature of something over 180°C. The coke breeze was mixed by hand with the melted pitch and mixtures were obtained containing from 10 to 20% of pitch. The coke breeze used was $\frac{5}{8}$ in. to 0 in. in size, including the dust, and the pitch was of the ordinary hard quality. The resulting fuel was practically free from dust and consisted of agglomerated pieces of 1 in. to $\frac{1}{2}$ in. size. On mixing, the fuel sets very quickly and there is no dirt or stickiness. It is therefore handled in the same way as small coke and fired by a hand shovel.

Further tests were carried out to observe the amount of flier coke blown over the fire bridge and the amount of smoke made and the time the flame lasted.

Test A.—A mixture of 10 parts by weight of breeze to 2 parts by weight of pitch was fired on the right-hand side of the grate and coke breeze alone was fired on the left-hand of the grate, the steam pressure on the steam jets being a full turn of the valve from an 80 lb. pressure supply. Observations were that on the right-hand side of the grate there were no coke fliers rising, but on the left-hand side the coke fliers from the coke breeze alone were considerable, as is usual.

Test B.—The mixture used was 10 parts breeze to 1 part pitch, and the furnace grate was fired all over with the mixture with the same steam pressure on the jets. The observations were that the amount of pitch was not sufficient to coke the mixture fully, and there was also a certain amount of coke fliers blown over the fire bridge, but there was no smoke.

Test C.—For this we used 10 parts of breeze to $1\frac{1}{2}$ of pitch, and the mixture burned the same as bituminous coal slack, coking well. There was very little smoke and no coke fliers. Under the conditions of hand-mixing, this was the best mixture, and it burned with a lasting flame.

Test D.—A mixture of 10 parts breeze to $1\frac{1}{4}$ parts pitch was tried, but a small amount of coke fliers was observed.

From the above tests it appears that 10 parts of breeze to $1\frac{1}{2}$ parts of pitch is the best mixture.

I understand that arrangements are being made on larger works to fire a range of boilers, where it will be possible to ascertain the increased steaming results and the behaviour of the fuel on the full output of the boilers.

It appears that the results of the forthcoming tests may lead to the installation of mechanical mixing and handling devices.

Horsham Gas Company, Ltd., Yours faithfully,
19, *London Road, Horsham.* H. ROWLAND.
Sept. 6, 1943.

Non-Lighting Back Burners

DEAR SIR,—In your issue of Aug. 25 you publish a "written contribution" by Mr. A. J. Leather (Blackburn) on the Problem of Calorific Value, in which he stresses the need for a burner capable of attaining theoertical air/gas ratios without lighting back and asks "Can this condition be approached without resort to mechanical pressure?" I should like to assure Mr. Leather that it can be, and has been done quite simply, and to draw his attention to my letter published in "GAS JOURNAL" of May 19, p. 611. In that letter I stated that, with my partner, I had evolved a simple modified bunsen burner which, with a plain open mixing tube, on low pressure gas, had given air/gas ratios up to and beyond theoretical. I also stated that it was quite impossible to make this burner light back or even to light it at the gas orifice or air holes with a naked light. No gauze or the like is used.

These claims aroused interest at Leeds University, and soon afterwards a demonstration was carried out there at which it was agreed:

(*a*) When supplied with Leeds town gas of 470 B.Th.U. up to pressures of 4 in. water gauge the burner performed all that was claimed, especially as regards freedom from backfire.

(*b*) On neat blue water gas of 295 B.Th.U. the burner was not so satisfactory, but

(*c*) There was evidence that, as it stood, the burner would work with gas containing a large proportion of water-gas and could, if necessary, be modified to take blue water gas itself.

Owing to the limited time at our disposal it was not possible to compute the air/gas ratio, but from flame characteristics it was agreed to be high.

The success of the burner was attributed in part to its small size and low thermal output, but this has since been disproved, as we have now made larger burners, one of which, consuming 20 cu.ft. per hour, upwards, we have fitted to a typical cooker boiling ring, and another, consuming 50 cu.ft. per hour upwards is being fitted to a gas copper or home washing machine. Each has the same high aeration and freedom from lightback as its earlier but smaller prototype.

We regret that we are not yet able to give full details of this burner as patent applications have been lodged abroad, but if Mr. Leather or any other interested party would care fore a practical demonstration of a burner we should be pleased to arrange for this.

Finally, if, as Mr. Leather contends, "the actual air entrained expressed as a percentage of the theoretical amount required is a measure of the efficiency of the utilization of the gas concerned," then this burner is capable of 100%.

14, *Queen Anne's Grove,* Yours faithfully,
Ealing, W. 5. A. H. GREAVES.
Sept. 4, 1943.

Processing of Gas Liquor

DEAR SIR,—In the very interesting Paper on the Processing of Gas Liquor read by Messrs. Baird and Parrish, attention is called to the fact that frequently a high concentration of ammonium salts is found in spent oxides, and that this results from excessive quantities of ammonia being passed forward with the gas on the pretext that it is necessary to maintain an alkaline working condition.

The Authors point out that the presence of ammonia salts is detrimental from the acid-making point of view, and also the cause of considerable trouble when such oxides are used for the production of prussiate of soda. It cannot be too strongly emphasized, however, that a further disadvantage is that an attempt to neutralize acidity in oxide by the introduction of large quantities of ammonia may result in the formation of an excessively acidic condition due to the fixation of hydrocyanic acid in the form of sulphocyanides, particularly ferric sulphocyanide.

Examination of spent oxides shows that high acidity may arise from two causes, the first and commonest being the formation of a high ferric sulphocyanide content, and the second the formation of ferric sulphate, particularly if the oxide is overheated or has actually caught fire. As the Authors point out, in both cases neutralization is best effected by the addition of lime.

Manchester Oxide Company, Ltd., Yours faithfully,
Miles Platting, Manchester, 10; H. B. AVERY.
Sept. 9, 1943.

Diary

Sept. 16.—Association of Gas Corporations: Council, 3.30 p.m., Gas Industry House.

Sept. 20.—London and Counties Coke Association: Finance Committee, 10.30 a.m.; Executive Committee, 11 a.m.; Central Committee, 12 noon; Annual Luncheon, 1 p.m.; Annual Meeting, 2.45 p.m., at the Waldorf Hotel, Aldwych, W.C. 2.

Sept. 22–23.—Association of Public Lighting Engineers, Institution of Mechanical Engineers, S.W. 1.

Sept. 30.—Institute of Fuel, Paper by R. Lessing, "Rational Preparation of Coal," Institution of Electrical Engineers, Savoy Place, W.C. 2, 5.30 p.m.

Oct. 6.—Southern Association of Gas Engineers and Managers (Eastern Section), Paper by Dean Chandler, entitled "Gas Flames, the Case for Aeration entirely at the Point of Combustion," Gas Industry House.

Oct. 7.—Illuminating Engineering Society (South Wales Area), Mackworth Hotel, Swansea, 5.30 p.m.

Oct. 11.—National Federation of Gas Coke Associations: General Committee (Special Meeting), 2.30 p.m., Gas Industry House.

Oct. 12.—National Federation of Gas Coke Associations: General Committee, 10 a.m., Gas Industry House.

Oct. 14.—Institute of Fuel, Annual Meeting and Luncheon, Connaught Rooms, Great Queen Street, W. 2.

Oct. 18.—Institute of Fuel (North-Eastern Section), Address by J. G. Bennett, Director B.C.U.R.A., Central Station Hotel, Newcastle-on-Tyne, 5.30 p.m.

Nov. 26.—Southern Association of Gas Engineers and Managers (Eastern Section), Paper by Dr. Weston and Dr. Haffner, entitled "New Evidence in regard to the Mechanism of Carbonization in Continuous Vertical Retorts," Gas Industry House.

The fact that goods made of raw materials in short supply owing to war conditions are advertised in the "Journal" should not be taken as an indication that they are necessarily available for export.

North British Association of Gas Managers

The Annual Meeting of the North British Association of Gas Managers was held on Sept. 3, in Glasgow. Mr. R. M. Simpson, Denny, the President, was in the chair. The President intimated the loss by death of a life member, Mr. John Gibb, Prestwick; of two Ordinary Members, Messrs. Robert S. Taylor, Haddington, and Andrew Thomson, Inverness; and one Extraordinary Member, Mr. John L. Butler, of Messrs. W. J. Jenkins & Co., Ltd.

The President welcomed Mr. J. Jameison, President of The Institution of Gas Engineers, and Dr. W. T. K. Braunholtz, Secretary. Mr. Jamieson extended the good wishes of the Institution.

The Annual Report was approved and the following elected to membership: Messrs. Charles R. Trotter, Kennoway; John Ford, Inverness (Ordinary Members); and Messrs. Ben C. Morton (Robert Dempster & Sons, Ltd), and Frank R. Bradley (Slight & McKimmie, Glasgow) as Extraordinary Members.

The President handed over certificates gained in the Institution Examinations as follows: 1st class, Certificates in Gas Engineering (Manufacture), Wilfred Brown, Leven; 2nd class, James T. Christie, Greenock; and F. B. Kerr, Johnstone.

Luncheon Speeches

At the luncheon which followed, Mr. Simpson occupied the chair, and after the loyal toast, Dr. **E. W. Smith**, C.B.E., proposing the toast of "The County and City of Glasgow," said he used to be with the Ministry of Fuel and Power, and left because he did not think it consistent with his own dignity or that of the Industry to remain. He had no reason to believe that he had done wrong. There was nothing to be proud of in the way their Industry had been administered in the last three months. The way things had been handled in those months was all the evidence they wanted for the nationalization of the Gas Industry as it stood to-day. The story was going about that the Ministry of Fuel and Power was trying to rush the Industry into nationalization. It was said that if the Industry did not do certain things by a certain date the Ministry would take things into its own hands. It was unheard of for a Ministry, except for war purposes, to introduce legislation in the way indicated. Over two years ago Sir Andrew Duncan warned the Gas Industry. They had had two years in which to get something done. No cut and dried scheme was demanded. The Industry was being asked to indicate the means to be adopted for studying the situation and to make recommendations. In itself the Ministry was not likely to devise a scheme of reorganization. In all likelihood it would create an independent expert committee to take evidence from the Chartered Institution, from the National Gas Council, and similar bodies and, what was of equal importance, from the County Councils, the consumers, the coal industry, and anyone interested in gas. As a result of the evidence it would put forward recommendations and might suggest legislation. He had been asked if he was in favour of nationalization. His answer was to ask what was meant by nationalization. The London Passenger Transport Board, the Port of London Authority, the Electricity Commissioners—these were all forms of nationalization. Before anyone should ask if they favoured nationalization they should indicate what was wrong with the Gas Industry. How could anyone connected with a large London company give satisfactory advice concerning, say, gas undertakings in the provinces. How could the advice of holding companies be taken for the municipalities and *vice versa*. Any committee set up by the Industry itself must consist of individuals with opposing vested interests. It should be possible to bring into being a committee of independent individuals that could receive evidence from all the interests concerned and report to the Minister of Fuel and Power. Those of them who have confidence in the future of the Industry were not afraid of the findings of such a committee. He urged them not to be rushed into decisions of which they did not see the full import. They could not give a blank cheque to anyone.

Councillor **Hector McNeill**, J.P., City Treasurer, Glasgow, replied.

Mr. **Joseph Westwood**, Under-Secretary of State for Scotland, proposing the toast of "The Gas Industry," said the Industry had given great service to the State, particularly in wartime, but he felt it could have given even better service had it been better organized.

He had the responsibility of preparing plans for completing 500,000 houses in Scotland in ten years. He wanted the expert advice of the gas and electricity industries as to how to provide a better standard of housing. As Chairman of the Advisory Housing Committee he had not himself the expert knowledge needed. But they had set up committees of people who were interested, but not with an interest—two different things.

Mr. **J. Jamieson**, President of the Institution, replying, said that in the future, science and industry would become more and more the foundations of national security, and the basic need of all industry was fuel—fuel for power and heat and light. Should their next step then not be to ensure by every means in their power that none of the coal so hardly won was wasted? That they should stop digging out coal as fast as they could, using much of it wastefully and sending as much as possible out of the country at cut prices? That they should instead process all the coal in their own country, not only to provide more efficient fuels for home use, but to yield for export commodities whose value, by reason of the labour and skill expended on them, was high in proportion to the cost of the coal used in their manufacture? The carbonizing industries pointed the way. The President of the British Gas Federation in a recent memorandum to the Ministry of Fuel and Power estimated that the gas and coke produced from 20 million tons of coal carbonized annually by the Gas Industry replaced in use no less than 50 million tons of raw coal, a net annual saving of 30 million tons. Translated into terms of manpower, this meant that 100,000 underground pit workers had been released from uncongenial toil and corresponding employment had been provided on the surface. This was not only a great humanitarian achievement, it was a vital contribution to the conservation of their greatest natural asset. And that was far from being the whole story; there were other economic and social gains. The economic gains lay in the wide variety of valuable by-products which became available through the carbonization of coal. The social gains from the carbonization of coal were no less remarkable. By the use of gaseous fuel on tap and of smokeless solid fuels, the housewife could be relieved of much drudgery and her energies left free for more congenial tasks. Atmospheric pollution which did so much damage to human life and property, could be banished from the land, and with it much of the respiratory disease which afflicts our people. If the 500,000 houses to be built in the post-war years, and which would house nearly half the population of Scotland could be made entirely smokeless, they would be a lasting tribute to the wisdom of the Committee over which Mr. Westwood presided.

Mr. **R. Keillor**, Greenock, presented the Presidential Medal to Mr. Simpson, who returned thanks and installed Mr. R. Fife, the new President, with his chain of office.

It was announced that Mr. T. S. Lockhart, Rothesay, had been elected junior Vice-President, with Messrs. David Fulton, Helensburgh, and D. D. Melvin, Edinburgh, as members of Council.

The proceedings closed with a general vote of thanks by Mr. **Fulton**, responded to by Mr. **R. Sturrock**, Secretary.

Domestic Heat Services Committee

For some time now the British Commercial Gas Association has been conducting research into the whole question of Kitchen Planning and the heat services which can be provided by gas and/or coke in the home, with particular reference to the post-war home. A Committee has been set up, known as the Domestic Heat Services Committee, with the following terms of reference: "To give practical application in a co-ordinated manner to the work of the various central Committees within the Industry covering all domestic uses of gas and coke, and to guide the advocacy and use of domestic gas and coke appliances in relation to (*a*) publicity, (*b*) representations to local authorities or Ministries, and (*c*) the arranging of model kitchens and exhibits throughout the country."

The composition of the Committee is as follows:

Mr. T. Brown, Chairman.
Mr. C. A. Masterman (Post-war Planning Committee).
Mr. R. J. Rogers (Gas Installations Committee).
Mr. J. E. Davis (Utilization Sub-Committee).
Dr. H. Hartley (Gas Stove Makers' Panel).
Mr. W. L. Boon (Federation of Gas Coke Associations).
Mr. L. Friedman (S.B.G.I. Water Heating Section).
Mrs. Abbott (Women's Gas Council).
Mr. A. B. Seton, Mr. L. H. Hardern, Mr. W. H. Becket, Mr. W. L. S. Spinks } Publicity Panel.
Miss Jane B. Drew, F.R.I.B.A.

Ex-officio Members:

Mr. W. J. Sandeman (Chairman, B.C.G.A. Executive Committee).
Mr. P. J. Lucas (Secretary, B.C.G.A.).
Mrs. Eileen Murphy (Secretary to Committee).

Miss Jane Drew has been retained as consultant to undertake a comprehensive research on the subject of kitchen planning, with a view to the production of plans for practical kitchens equipped with gas and/or coke services to suit varied needs and income ranges.

The July-August issue of the *Broomwade News Bulletin* contains an illustrated article on the use in gas-works of equipment made by Messrs. Broom & Wade, Ltd., High Wycombe.

The South-Western Gas and Water Corporation, Ltd., is paying on Oct. 19 an interim dividend on the Ordinary Shares of 2% (actual) less income tax, in respect of the year ending Dec. 31, 1943.

The Illuminating Engineering Society is arranging a special meeting at Swansea on Oct. 7, when Dr. J. H. Shaxby will give a lecture entitled "The Physiological Aspects of Lighting."

The Whessoe Foundry and Engineering Company, Ltd., vacate their temporary premises as from to-day, and resume active occupation at their previous address: 25, Victoria Street, London, S.W. 1, to which all future communications should be addressed.

RETORT HOUSE ECONOMY*

By C. A. POULSON, M.I.Mech.E., F.C.S., M.Inst.Gas E.

I APPRECIATE very highly the honour your President and Secretary have done me by asking me to present to you a Paper, consequent upon the unfortunate illness of Mr. Rowan, and in response to their request I feel called upon to give, without reserve, and with what impartiality I may, an account of observations made during my experience of carbonizing operations in Scotland, so that we can debate failures and successes in the hope that our deliberations may prove of some general use and interest.

The Gas Industry is well into the second century of its existence. It has already set an example in the industrial world in the practical application of organized research, and that by the voluntary effort of men who have set themselves, in a broad and liberal spirit, to the solution of scientific and technical problems. To-day the drive is for still greater efficiency of production and a still further increase in works economy.

We must not, however, let it be imagined that the Gas Industry suddenly finds itself requiring drastic treatment. No other industry can show a better record of research, whether into production methods, problems of purification, or improvement of appliances, than our own. In the last thirty years gas production has been mechanized, purification brought to a high level of efficiency, while appliances have combined artistic design with economy both of fuel and labour.

Comparing the thermal efficiency of our process with that of electrical generation, it is interesting to note, since it is perhaps not yet generally realized, that, as compared with a thermal efficiency of 85% obtained in modern gas-works carbonizing plant, the best figure that can be produced by the most up-to-date power station is 30%, and many of the super-power stations are attaining no higher a figure than 25%. Now, 25% thermal efficiency requires generation at the rate of about 1 lb. of coal consumed in the boilers per unit generated, and some of the older stations are taking 2 lb. or more.

In respect of coal carbonization the present national endeavour is to attain a further overall improvement on present results. It is directed to applying more closely the experience and research already in our possession to increase efficiency by economizing in even the smallest detail. Under the stress of war conditions the necessity of conservation will be realized by even the smallest undertakings, and the aggregate saving to the country will be considerable.

The present trend, too, is to see that improved results are quickly obtained by the application of available knowledge to operating practice. The activities of the Gas Advisory Boards, whether dealing with specific problems in the Industry or relating to individual undertakings, will provide for free and frank exchange of information and experience that will surely lead to ultimate good by making the experience of all available to each.

It was, therefore, with these points in mind that I chose the subject of Retort House Economy for this Paper.

Coal

Four years of highly scientific war have taught us, as never before, how vital are our coal supplies, and how utterly dependent we are upon them. Many new industries, to mention only plastics, synthetic rubber, and liquid fuel, will develop, and the Gas Industry is destined to play no inconsiderable part in these fresh fields.

It is thus evident that much greater care will have to be exercised in avoiding the wasteful use of coal with consequent nation-wide inefficiency. It is now recognized by technicians, if not by politicians, that our store of bituminous coals at least must be processed in such a way as to obtain from them not only a high proportion of their fuel value in convenient forms, but those by-products which have become indispensable to modern civilization.

In any discussion of carbonizing economy, one must begin with an examination of the quality of the coal.

Last year my attention was called to a consignment of Scottish coal (Doubles) having an ash plus moisture content of 24.7%. Imagine what waste this means to a transport service alone: one wagon in four carried unnecessarily. To the gas undertaking it is much more serious, since from every £1 spent on coal 5s. is paid for ash and water; works handling costs are increased roughly by a quarter; 25% increased carbonized capacity is required and the producer area is decreased by about 33%, as the heavy inert content produces cumulative increase of clinker by reducing the fuel depth and short circuiting. The quality of the resultant coke is seriously affected, accompanied by a considerably higher breeze content. I have given an example of records over the past six years at one of the largest undertakings in Lanarkshire, where the inert matter in the coal supplied has increased by 50% in that time.

Efficiency Targets

The second law of thermodynamics suggests that no inventor, patent he never so wisely, can use heat to effect any sort of work, without losing some at least of the original heat. He may, and in practice often does, lose much more than the theoretical minimum, but that minimum he must lose. We want to know, therefore, what improvement is possible, and the lines upon which we can effect changes or economize to keep as near as possible to this irreducible minimum of loss.

Even when full and accurate details of each undertaking's carbonizing practice are available, it will be found that certain factors differ so much that difficulty will be experienced in devising a formula by which performances can be fairly compared.

The type of gas-making plant, whether verticals, horizontals, or water-gas, accompanied or not by waste-heat recovery, and the difference in calorific value of gas made, are among the factors which render comparisons complex and difficult.

Efficiency targets drawn up to match each set of conditions as closely as practicable would, I believe, provide a more valuable basis for the comparison of results than the Fuel Index figure which has been proposed for this purpose.

I have made an attempt in Tables to set up such targets in the form of calculations showing the results which may reasonably be expected from installations of continuous vertical retorts, treating Lanarkshire coals making gas at different calorific values and in any different size of plant with and without waste-heat recovery. Tables and diagrams show the distribution of the potential heat fed to the producer throughout the plant and indicate where economies are to be made. In the following passages of the Paper I have set out in detail the suggestions I have to make for securing these economies.

In the first place, let me say that I trust it will be appreciated that of necessity the suggestions refer primarily to the type of plant with which I have been associated for the last 25 years.

In the second place, I have been much indebted to the notable Paper presented last year by Dr. Pexton to the London and Southern District Junior Gas Association on the Fuel Requirements of Carbonizing Plants. No serious study of fuel economy in gas-works, whether on the part of the gas manager or of the plant designer, can in future afford to neglect this magnificent contribution to the technique of gas manufacture.

The Producer

I have emphasized the value of instruments and scientific control generally because it cannot be too strongly urged that the real road to efficiency is to know accurately what you are doing and why you are doing it. And I have written more about the producer than any other section of the plant because it is here that the foundation is laid for retort house economy. With regard to the control of producers, the first step is to obtain accurate measurements of the fuel supplied. The amount of fuel used in each producer should be checked daily in order to ascertain the cause of fluctuations which otherwise pass unnoticed. In the larger installations the expenditure on the automatic weigher and totalizer is amply justified by the economies which it renders possible. In the smaller works improvizations have been indicated which give information upon which control can be based.

Daily Orsat tests of producer gas, taken two to three hours after cleaning, will reveal abnormalities indicating necessary action before a falling-off of results becomes serious.

The step-gate producer is designed with a margin of grate area to allow for restriction by clinker when operating on full load. Therefore, when supplying only the fuel gas requirements for a reduced number of retorts the grate area is larger than required. Under these conditions the top two or three bars can be temporarily bricked up, and in one instance where this was done a saving of 1½% of the producer fuel, on coal carbonized, was made—*i.e.*, fuel consumption was reduced from 17½ lb. to 16 lb. per 100 lb. of coal carbonized. Smaller bricks can be left loose at the ends and centre, for the insertion of the poking bar, and the whole can be easily removed when the producer resumes full load.

For efficient producer operation the fuel bed temperature within the producer is most important, since too high a temperature creates excessive clinker, while a fire too cool cannot give proper reaction, and results in excessive formation of CO_2. The most suitable fuel bed temperature varies according to the class of coke used, but in Scotland it may be generally taken as between 1,100° and 1,200°C. A good if rough and ready means of inspecting the internal temperature of the producer is to drive a pipe into the fire; after a few minutes' insertion, the pipe, on being withdrawn, will reveal the temperature and extent of the reaction zone.

If the cross-section of the reaction zone is smaller than usual it denotes the presence of clinker deposits or ash. As a guide to the stoker the poking bar should be marked to correspond with the various plate levels, so that he knows when all the clinker has been dislodged without damage to the internal brickwork.

The most satisfactory producer conditions are obtained by the removal of all the dust below ⅛ in., as this generally contains between 25% and 30% ash, which increases clinker formation and causes

* Abstract of a Paper to the North British Association of Gas Managers, Sept. 3.

channelling in the fuel bed and short-circuiting of the air through it, with consequent deterioration of producer gas quality and more dust carried forward to the setting.

The modern producer can consume successfully, and with almost equal efficiency, any of the smaller grades of fuel (except the dust), and thus release the more readily saleable grades for district sales.

Pressure Producer

This was first introduced to enable lower grades of fuel to be used, but it is now evident that there are collateral advantages in working the settings under definite and controlled pressure which, in themselves, justify the use of the pressure producer. In this type of producer the grate is enclosed by a door, and the primary air is delivered to it by means of a steam injector, forming the necessary air-steam mixture with the steam so used. By careful design of the injector for its special purpose, the fault of too much steam being required to inject the amount of air required is eliminated. A well-designed injector, when operated without restriction upon the air supply, should leave a deficiency of steam in the primary air to be made up by the introduction of a supplementary supply, or by evaporation of water from the fire bars and ash-pan.

The crux of successful pressure producer operation is to maintain the correct steam/air ratio, which obviously varies according to the class, rather than size, of coke used. More precisely the ratio depends upon the amount and properties of the ash, and for any given set of conditions it can fairly soon be found by trial.

The proportions of steam and air are directly related to temperature, and a thermometer, mounted upon the air/steam inlet to each producer, indicates the temperature (and hence the ratio) of the air/steam mixture at its entry beneath the grate. When operating Scottish coals it will be found that the least clinker trouble will be attained when operating the pressure equipment with a steam/air mixture temperature of 120°F. to 130°F. To reach this figure it may be necessary to check the primary air supply to the injector. More recently primary air to the injectors has been drawn between the hot walls of the producers, thus conserving heat which would otherwise be lost by radiation.

Technical Supervision

I believe that more technical supervision in gas-works, accompanied by an increased number of instruments, would go a long way to assist in the present drive for fuel economy. In these days, when the gas engineer has so many calls upon his time, it is becoming increasingly necessary for him to depend largely upon telltale indicators and recorders. Read and reported at prescribed intervals and maintained in working order, even by a junior, these will enable the engineer to issue instructions for alterations and adjustments on a basis of accurate information rather than verbal reports.

I recall one works employing a boy from a secondary school on pyrometer readings, Orsat, calorimeter, and other tests, who, after three months, was supplying important and useful information correctly to the engineer. In his keenness for further laboratory and works experience, this young man now handles, after eight months, all works tests, including coal and oxide testing, and completes the daily records. In other works where senior chemists have been unobtainable, women are being introduced with notable success.

In the larger works, Mr. Finlayson has shown that a technical assistant can earn his salary of £350 per annum if his work leads to no more than an extra therm per ton, accompanied by a very small reduction in producer-fuel consumption.

I am a strong advocate for the use of instruments wherever possible. For instance, a CO_2 recorder for flue gases, a thermocouple at the boiler inlet, steam meters, &c., all convey a fund of information and quickly pay for themselves if reasonable care is taken to keep them clean and in working order, and to act upon the information which they give.

Operation of Retorts

In this section I have referred to rodding and the use of the lengthened division plate and to the necessity of looking to the effectiveness of the steam supply, and finally to scurfing, a most important operation, the careful control of which can very materially prolong the life of the retort. This subject is allied to the treatment of refractories generally. The great point in heating up silica refractories is to make sure that the temperatures increase gradually and progressively. On on account allow the temperature to fall within the critical range. With regard to the maintenance of retorts, I have described some methods and referred to the recently introduced "retort welding," the study of which will be well repaid.

Progress in design has, so to speak, been rounded off by the "balanced-heating" setting, so ably and fully described by Mr. Rea in his Paper of 1939.

In view of the increasing amount of Durham and Northumberland coals now being sent into Scotland I have included a brief note as to their treatment in vertical retorts.

There are, of course, some Scottish coals, such as Bannockburn, Polkemet, &c., which have a higher swelling index than average, and it is found that as the quality of the gas produced increases, the easier such coals can be treated in the retorts. The same applies to Durham coals, and is accounted for largely by the fact that, owing to the higher throughput with higher quality gas, the charge is kept more constantly in movement, with less tendency to hold up.

Operators accustomed to the non-swelling varieties do not take kindly to Durhams, but provided the retorts are in reasonable shape, undue carbonizing difficulty should not be experienced, particularly when only a mixture is carbonized, as is now the case in Scotland. An addition as low as 15% Durhams is having a beneficial effect upon the carbonizing results.

Mixing of coals is important to obviate segregation within the retort. This should be done as thoroughly and efficiently as circumstances permit, and since few works have special equipment for this purpose, the engineer has to exercise his ingenuity in devising simple improvisations with the means at his disposal.

Waste-heat recovery is one of the more obvious methods of obtaining economy of the retort house, and I have referred to some of the main points to be watched in the operation of the waste-heat boiler. Air infiltration is the arch enemy of economy in the waste-heat boiler. It absorbs heat which should be used for steam-raising and it overloads the boiler fan. Augmentation is a matter for argument, and while I have put the facts before you I strongly recommend you to read Dr. Pexton's observations both on this point and on waste-heat recovery in general.

My remarks on mechanical maintenance and coke screening are brief, but I trust you will agree that in the present shortage of skilled labour it is particularly necessary to "keep on top" of maintenance by systematic inspection and timely action.

My Paper is mainly concerned with the vertical retorts, but there is in Scotland a considerable number of small gas-works equipped with horizontal retorts. Economy in the small works individually falls upon the manager himself and is a matter of a large number of small details, but the fundamental principles are the same.

My primary object in the Paper has been to set out targets for thermal efficiency at which gas undertakings could aim, to underline the fact that reasonably regular quality of coal is indispensable to this effort, and that the demand for it is in the economic interests of the nation as well as of the Gas Industry. I have also endeavoured to make suggestions for economies in carbonizing practice.

Discussion

Mr. **A. Jamieson** (Johnstone) said they had always associated Mr. Poulson with carbonizing problems, but his views on the working of boilers would be much appreciated. It would be interesting if he could tell them if his thermal efficiency figures were being produced at the present time with the variable fuels they were getting. In his own case he often found it almost impossible to estimate for eight hours ahead, due to the variations in coal. In the past, when cost per therm into the holder was the criterion, several Papers were read showing the cheaper therm to be obtained at the higher calorific value, but now they had Mr. Poulson proving conclusively that the highest efficiency was at the lowest C.V. He would like to know how Mr. Poulson reconciled his figures with those of cost into holder. It was perhaps unfortunate that the Author did not include benzole recovery in his thermal efficiency figures. With regard to the treatment of silica retorts, at Johnstone they were let down each year after the winter load and, as far as could be seen, no definite harm was done, as several of the retorts had worked for ten years. Did Mr. Poulson really think it was a mistake to let them down after being heated up? His own view was that the real danger to silica retorts was when the first heating was being given and the temperature was between 300° and 600°.

Mr. **T. S. Lockhart** (Rothesay) said the Paper was timely in view of the work to be carried out by the Scottish Gas Engineering Advisory Board. Mr. Poulson had mentioned a salary of £350 for a chemist. He did not think this was high enough. There were instances of truck drivers receiving almost as much. It would be beneficial if the Author would give the figures of costs of pressure producers against natural draught, and the amount of steam used. Could the Author also give some information about the effect of Durham coals as compared with Scottish varieties on the life of vertical retorts?

Mr. **E. G. Smith** (Dumbarton) said that although the material in the Paper had been prompted by wartime conditions, the knowledge contained therein could be usefully employed in peacetime. Every gas engineer sought to obtain the highest thermal efficiency from his plant, and the tables given in the appendix provided a useful basis of comparison. He appreciated that thermal efficiency without consideration of the financial results did not constitute "Retort House Economy," but at the moment that was outside the Paper.

The Paper indicated increased thermal efficiency with the production of lower C.V., and he would refer to Mr. Jamieson's Paper "Calorific Values and their Relation to Working Results and Costs," presented to the Association in 1932 bore out the speaker's claims for increased thermal efficiency at the lower grades. However, in the 1932 Paper, a point of note was the increase in inerts at the lower C.V.—viz., 15.61% at 400 B.Th.U. per cu.ft., and when undertakings were striving at the present time to reduce their total inerts to not more than 10%, he felt had Mr. Poulson stated the composition of the gases at the various grades the Paper would have been greatly enhanced. He maintained that only by controlling inerts at a low figure could the highest thermal yields be obtained. Thus, it would appear that there was a limiting factor in the reduction of calorific value by the normal

methods of steaming in verticals, and if lower C.V. was to be the order of the day, alternative methods of reducing the C.V. without increasing the inerts must be sought. He had found that to produce gas of 400 B.Th.U. per cu.ft. gave a total inert content of 13.5%, whereas, to produce 415 gas and debenzolize to 400 the total inert content was approximately 12.5%. Did increased thermal efficiency increase in still lower grades of gas? Bearing in mind the control of inerts, how far would the Author be prepared to go?

In the tables the Author rightly claimed credit for the contribution made by waste heat, and he (the speaker) considered a waste heat boiler an essential part of any continuous vertical plant. He had an opportunity of assessing, in a practical manner, the effect on waste heat recovery on his plant, and the figures obtained for similar working conditions were:

Thermal efficiency with waste heat recovery .	78.7%
Thermal efficiency without „ . .	71.5%
Difference . .	7.2%

This figure was higher than that claimed by the speaker.

When a junior, he was told, "If you want retort house economy, start at the producers." This was brought home to him very forcibly when coals of lower quality were directed to his undertaking. The production of producer gas was by a combination of natural draught and pressure producers supplying a common CO flue. With the resultant drop in coke quality, the quality and quantity of CO could not be maintained with falling-off in coal gas output and quality, despite frequent clinkering. After examination it was decided to put an additional producer to work, and the results indicated the wisdom of the decision.

(*a*) Coke to producers per 100 lb. coal carbonized was reduced from 14.1 to 13.4 lb.

(*b*) Steam per cubic foot weight on coal was raised from 17.5 to 20.

(*c*) Make per retort increased 13.3%.

(*d*) Make per ton increased 6.8%.

His experience had taught him that control of producers and CO production was the first essential to town gas production.

Mr. Poulson did not indicate whether his results referred to natural draught or pressure producers, and if with the latter, what was the effect on the thermal efficiencies when the steam to producers was debited.

Mr. **R. Fife** (Kilmarnock) said he would like to draw attention to a statement which Mr. Poulson had made in connexion with the operation of waste heat boilers, when he indicated that excessive infiltration of air was the deadly enemy of waste heat recovery. On one occasion he followed up an investigation on this particular weakness in his own plant, and was astonished to find that by correcting certain faults he was able to increase the evaporation by as much as 1 lb. steam per lb. of coke. The chief source of trouble at that time was traced to leakages from a setting not under heat and the measures taken to avoid air infiltration were to temporarily brick up the outlet flue on this idle setting, along with the sealing up of other minor sources of leakage into the main flue.

In discussing steam problems Mr. Poulson drew attention to the need for maintenance on steam engines and pumps in order to attain the best efficiencies there. Wear in the cylinders or piston rings and in the steam chests of these appliances could easily prove a fruitful source of fuel wastage. This might seem a minor wastage, but over 24 hours per day working periods cumulative losses could quite well assume serious proportions.

He would greatly appreciate Mr. Poulson's opinion on an alteration which he recently made in the daily cleaning of the producers. He found on inserting short false bars on top of the third plate of the step grate that the material withdrawn from below this level consisted almost entirely of ashes—in fact the fuel content of this material was practically *nil*. Another advantage to be obtained by this procedure was in that slight disturbance in the fuel bed caused by the slipping down of the fuel when the bars were withdrawn. In this way they appeared to have overcome a problem caused by the adhesion of caked ash to the back and sides wall of the producers. The new method of cleaning would appear to displace this dead material which caused channelling and short circuiting of the primary air. The conditions he described might be peculiar to breeze burning producers such as they had in Kilmarnock and might have become aggravated by the present-day fuels.

Mr. **David Fulton** (Helensburgh) said that Mr. Poulson's Paper was full of useful hints for effecting economies in gas-works. None of these hints was of major importance individually, but cumulatively they became of considerable significance. He had been brought up never to blame coal, but nowadays the first thing they blamed was the coal. It was the modern fashion and it was an easy way out, but there must be other causes lying behind their deficiencies. They did not have enough technical supervision. It was their duty to recruit for their Industry young men of the right type. In this matter they had not always been so careful as they might have been. It was their duty to give these young men a course of training to equip them for the functions they were to carry out. It was not a matter of giving them the chance to attend a technical school and obtain some certificates. They had to learn in the works. He had nearly forty years' experience in the Industry and could think of few spheres where progress had been so slow as in producer practice. Producers were substantially the same now as forty years ago. It should surely be possible to design a producer with greater efficiency. There was no reason why the producer should be attached to the bench itself. Mr. Poulson, speaking of Durham coal, thought that 15% mixture was a low percentage. He (the speaker) thought it was high. They could not get big yields of gas and high efficiency from pulverized material. Regarding waste heat boilers, the design was defective so far as it concerned getting access to the tubes to remove scale from the interior of the nest. They were forced to use boiler detergents which were always expensive, but not always effective.

Mr. **Poulson**, replying, stated it was quite correct that Scottish coals produced a higher thermal efficiency at 400 B.Th.U. than at 500 quality. As shown in the graphs, the difference was slight, and occurred only when operating more easily carbonized coals, and, incidentally, did not apply to the harder Yorkshire or Durham coals. Thermal efficiency must not be confused with financial balance, because it had been conclusively proved that it paid to produce gas at 500 quality as against a 400 gas for the additional coke, provided, and this was important, that the price obtained for coke exceeded that paid for coal by 7s. 6d. to 10s. per ton.

Mr. Poulson stated that the figures and values which he had used in the thermal efficiency calculations were all acknowledged figures, and full details were purposely stated in order that it should be agreed that the values, and hence the calculations, were substantially correct. The gas figures had been taken from the familiar "steaming curves" which conform to established practice. The liberal allowance for producer fuel was purposely made, because, taking the instance of 400 B.Th.U. quality, the gas production figure of 24,700 cu.ft. per ton could only be obtained by taking full advantage of steaming reaction, which meant good heats, and hence a higher producer fuel figure.

Mr. Jamieson had raised a very interesting point when he asked what effect benzole extraction would have upon the calculations. This was perhaps a complex question, since it could be discussed from several angles, and as there was insufficient time to give more than a general and very brief reply, he would say that the efficiencies shown should remain the same, because the benzole extracted represented therms. Therefore, the benzole therms should be added to the gas therms, the addition of which should produce the same thermal efficiency balance as shown in the Paper.

On the question of lighting up and extinguishing settings, Mr. Poulson said he was a strong believer in keeping the silica material at working temperature, or above the critical range of 400°C. if possible. Each occasion a setting was brought from or extinguished to cold the full expansion and contraction took place, apart from cracks, &c. In other words, with Scottish silica there was no permanent expansion during the first heating up; it was all reversible expansion, as full conversion has already taken place during burning in the makers' kilns.

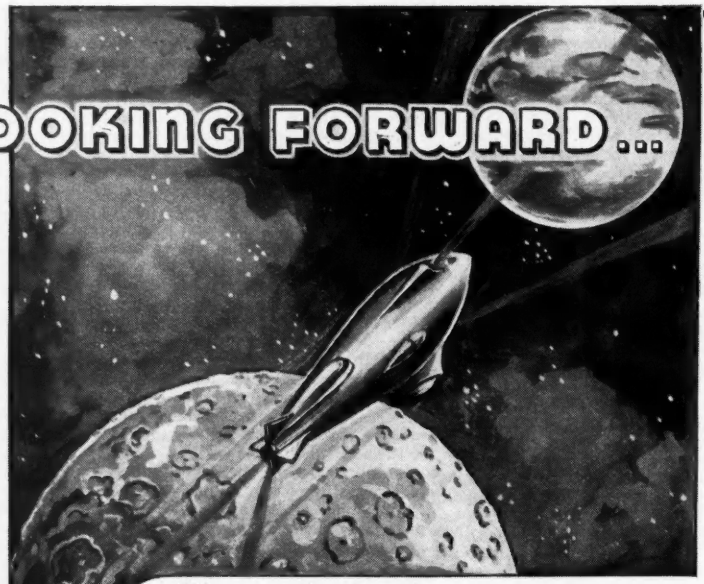
Mr. Poulson replied to Mr. Lockhart by saying that the main advantages of the pressure producer were, consuming lower grades of fuel, increased control and flexibility. It was of particular use when "topping up" the gas output to meet peak loads. With regard to the financial benefit of the pressure producer the only case he had in mind was a setting of eight 5 ton retorts carbonizing 40 tons of coal per day, the blower of which used 230 lb. of steam per hour. Taking steam, supplied partly by the waste heat boiler and partly by works boiler, at 8d. per 1,000 lb., the steam cost to the injector would be 2d. per hour, or 4s. per day. Adding 1s. for maintenance, which was well on the top side, brought the total to 5s.

Assuming that only two tons of inferior coke, of the 5 tons producer fuel used each day, at 10s. per ton less than the price of ordinary coke, this would mean a saving of £1, less 5s., or a net saving of 15s. a day, amounting to £270 per annum. These figures were approximate, but well on the conservative side, and illustrated Mr. Lockhart's question.

With regard to the effect on the length of retort life when using Durham coals, Mr. Poulson said that a reduction must be expected due to the possible higher oxygen or iron content and abrasive nature of the coke. When using wholly Durham, only half to two-thirds the life could be expected, as compared with the normal long life when carbonizing Scottish coals.

Replying to the question of the use of outside producers with carbonizing plant, Mr. Poulson suggested that gas engineers in this country seemed to have decided against this type because of the considerable decrease in efficiency due to the loss of sensible heat of the producer gas. They were high both in first cost and in operation, since the fuel supplied had to be very carefully graded and nothing below ¼ in. was allowed. The cost of maintenance was considerable, as revolving or other mechanical grates were liable to rapid wear and tear. Also, the system needed a water jacket, condensing and washing plants, which all made complicated and expensive extras. Finally, the ground space reqùired for this apparatus might be nearly as much as that occupied by the retort bench itself.

Mr. Smith had given some very interesting and practical figures of thermal efficiencies, with and without waste heat recovery, and, also, with and without benzole extraction, and he was glad to see that the figures had come very near to those set out by his own calculations in the Paper, and in some instances they had been exceeded. Replying to Mr. Smith's question concerning the higher efficiency at 400, and his query as to where this would go if the gas quality was reduced



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below 400 to say 200, the essential point in this particular discussion was that the gas quality cannot be reduced below 350 B.Th.U. by the addition of water gas. The graphs he had submitted in the Paper showed that the efficiency curves were very flat, and it was doubtful whether efficiency could be maintained with regularity below 400 B.Th.U. Certainly the reduction below 300 could only be obtained by the addition of nitrogen, which, at best, could have no beneficial effect upon efficiency. There was then the question of distribution through existing mains, and to distribute gas at 200 as against 400 required the handling of double the volume for the same therm content. In these circumstances it could only be expected that boosting costs would considerably increase, which might also be accompanied by a sharp rise in the leakage account.

Mr. Smith was correct in assuming that the efficiency calculations had been worked out on natural draught producers. Had they been based on pressure producers, allowance would have to be made for the steam, but, as pointed out, there were other advantages to be claimed for the pressure equipment which would probably offset the steam so used. In any case, the effect on the thermal efficiency figures as stated would be negligible, and perhaps only of the order of about 1%.

Mr. Poulson was glad that Mr. Fife had illustrated the important point in connexion with the reduction of air infiltration to the waste heat boiler, by increasing evaporation at his own works by 1 lb. of steam per lb. of producer fuel. The Author thought that if air infiltration and loss of steam by inefficient engines and pumps, could be expressed in terms of coal and coke, it would represent, in some works, many tons of boiler fuel per annum.

Replying to Mr. Fife on the question of inserting false firebars at about the third grate plate level, Mr. Poulson agreed that to drop the fire this small distance was always an advantage, as far as preventing short circuiting and channelling were concerned. It also disturbed the dust and fine ash which would cling even to vertical surfaces, and he thought the trials now being made at Kilmarnock would be advantageous.

When using Durham and Northumberland coals circulation and flushing were necessary, and he underlined the advantage of back pressure on the retorts in this connexion. He liked the method of utilizing the exhaust steam from the back pressure turbine for "steaming" the charge, particularly where a warm boiler feed water already existed, since the volume of exhaust steam was practically constant, and the only loss was the temperature drop across the turbine.

Processing of Gas Liquor

The following discussion took place on the Paper by Mr. W. Nicol Baird and Mr. P. Parrish, at the meeting of the North British Association of Gas Managers on Sept. 3—see "JOURNAL" of Sept. 8, p. 296.

Mr. **J. Dickson** (Dundee) said the Authors referred to the fact that gas undertakings in Scotland were for the most part small or of medium size, and that the two largest works—Glasgow and Edinburgh—adopted processes for the concentration of gas liquor at least ten years ago. Around that same time they in Dundee were also faced with the problem of whether to continue the manufacture of sulphate of ammonia or erect plant for the concentration of ammoniacal liquor. Offers were taken for this plant and investigation made into the costs of production. Such, however, did not then provide encouraging data for proceeding with erection of concentrated liquor plant—*i.e.*, in the year 1935.

After debiting costs of steam, water, labour, repairs and maintenance, pumping of crude and concentrated liquor, and general supervision, they found these amounted to from £3 8s. to £4 8s. per 100 tons of crude liquor of 0.812 free NH_3, and making 3.69 tons of 22% strength. After assessing interest, sinking fund, depreciation and obsolescence charges on a 15% basis, they found these between 24s. 2d. and 30s. 4d. per 100 tons of crude liquor on the respective offers received. In order to treat their entire output of ammoniacal liquor, then approximately 24,000 tons per annum, and meet carriage costs on the concentrated liquor, then 7s. 7d. per ton, along with working costs and the capital charges on the plant the various offers resulted in:

(1) *Cr.* £35; (2) *Cr.* £18; (3) *Cr.* £23; (4) *Dr.* £105; (5) *Dr.* £225, all per annum.

The sulphate plant was capable of dealing with 26,000 gallons of ammoniacal liquor of 1¼% total ammonia content, while producing 6 tons of dry neutral salt. Saturators, foundations under and around the saturators, engine for centrifugal dryer, draining table, &c., were all requiring renewal and reconstruction.

Working costs inclusive of acid, labour, maintenance, steam, &c., taken on the 1943–35 production figure of 724 tons of sulphate resulted in a debit balance of 6s. 6d. per ton.

In the last year's working prior to reconstruction, as high an amount as 24.25 cwt. of 144° Twadd. vitriol was used in the production of one ton of sulphate of ammonia. After reconstruction the figure was only reduced to 22.07 cwt. of vitriol, but a very thorough investigation into this source of loss had since then resulted in the figure being kept consistently under 20 cwt.

The decision to reconstruct was based on the fact that they had a good market in the neighbourhood for the sale of sulphate to fertilizer mixers or farmers, and that it would pay to reconstruct rather than incur capital expenditure on plant for the sale of concentrated liquor of the foregoing quality and then bear the heavy additional charges for carriage on the liquor.

In the result the choice had been amply vindicated.

In making comparison with the Authors' figure of working costs of sulphate of ammonia for the year ended May 15, 1941, his own figures were as follows:

	Perth.		Dundee (Production 940.36 tons).
Acid	£4 1 4 per ton of S/ammonia		£3 10 4.08
Steam	1 3 0 „	„	1 2 8.03
Maintenance ...	1 4 2 „	„	0 9 5.36
Labour	2 0 9 „	„	1 5 10.38
Levy	1 2 9 „	„	
Total ...	£9 12 0 „	„	£6 8 3.85
Revenue ...	8 7 4 „	„	8 5 11.5
Loss... ...	£1 4 8 „	„ Gain	£1 17 7.65

He would commend to attention the injunction in the Paper to ensure as far as possible a crude liquor of satisfactory quality, either for the production of sulphate of ammonia or concentrated gas liquor. They did not work a crude liquor of as high an ammonia content. The following were typical analyses of their ammoniacal liquor taken over considerable periods during last year.

Summer.				Winter.		
Free NH_3	Fixed NH_3	Total NH_3		Free NH_3	Fixed NH_3	Total NH_3
1.134%	0.127%	1.261%	...	1.208%	0.114%	1.322%

He would also emphasize the statement in the Paper that the saving in steam alone when processing gas liquor of 2% free ammonia in contrast with 1% free ammonia was 9s. per ton of concentrated gas liquor based on steam at 4s. 6d. per ton, and to use waste heat steam wherever possible.

To cover all the steam requirements of sulphate of ammonia production—*i.e.*, distillation, ejection of salt, centrifugal drying, steam drying, elevating, pumping—they estimated their requirements at 2.7 lb. of steam per gallon of crude liquor, treated, and everything was being done to lower this figure in the fight for fuel economy. In the year 1940–41, which the Authors took for costs of production of sulphate of ammonia at Perth, his own tonnage of steam amounted to 6,395 tons, equivalent to a coke and breeze consumption of 1,066 tons.

Mr. **Sydney Smith** (Paisley) remarked that the Authors stated: "The less the quantity of ammonia gas undertakings recover, or, to put it another way, the more ammonia that is wasted, the greater will eventually become the problem of the disposal of spent oxide." Apparently this was viewed from the aspect of some obscure form of balance between ammonia produced and sulphuric acid manufactured from spent oxide; probably from the point of view of the conversion of the ammonia to sulphate. He would be obliged if Mr. Baird would amplify this point. It was obvious, of course, that ammonia should be recovered to the greatest possible extent. Another point in this connexion was that the higher the strength of crude liquor obtained by circulation, the greater would be the amount of H_2S absorbed in the liquor, and, therefore, correspondingly less H_2S would be available as spent oxide sulphur. In other words, the load on the oxide purifiers would be eased by the amount of H_2S absorbed in the liquor.

The Authors stated: ". . . so it is equally important to retain as much undecomposed ammonium sulphide in the concentrated gas liquor as possible . . ." From whose point of view was the statement made? In his own case the central chemical works were anxious that they should reduce the sulphide content of their concentrated liquor to the lowest possible limit: but probably this might be due to local circumstances connected with the manufacture of some product of which he was not fully aware.

Reference was made to the use of a water governor on the supply to the spray feeding the foul gas scrubber. In this connexion he would like to refer to a difficulty experienced in his own case. Three years ago, automatic control was introduced to an existing concentration plant, but no provision was made for decarbonating, as it was not desired to concentrate higher than 15 to 18% strength. Almost immediately after starting up, trouble was experienced with blockages due to the formation of bicarbonate crystals at the condenser, and this when the concentration did not exceed 15%. Ultimately, the trouble was traced to widely varying fluctuations in water pressure, and it was decided to fit a water pressure governor on the supply line. This proved completely successful and they had extended the use of such governors to several sections of the works with equal success, including the benzole plant, where these were fitted on the water supply lines to the dephlegmator and final condenser, and to the rack coolers.

Reference was made in the Paper to the unsatisfactory recovery of ammonia in many gas-works, and to the fact that important undertakings failed to account for 3 lb. of ammonia per ton of coal processed. He would like to know if the Authors could give any information regarding the average recovery for the Industry as a whole. In his own case, where free ammonia only was recovered, pre-war this amounted to 6 lb. per ton of coal carbonized, and at present was slightly over 5 lb., the decrease being due to the greatly increased ash content of the coal and to the increase of fixed ammonia in the crude liquor. Pre-war this amounted to 10–12% of the total ammonia, whereas the present figure was very nearly 20%.

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Industrial Gas Conversions

By EDMUND BATES,
Manchester Gas Department

(*Concluded from p. 85*)

Acetylene

Flame Cutting by Ferrogas.

Ferrogas (a mixture of "Ferrolene" and coal gas) is replacing acetylene as a fuel in many cases where flame cutting is practised and as the process is becoming increasingly popular, a few notes may prove a useful addition to this paper.

Due to the speed and accuracy now obtainable by means of flame cutting with profiling machines, the use of this method of shaping ferrous materials is rapidly expanding. The oxy-coal gas flame has been used over a number of years for this purpose, one advantage over acetylene being a cleaner cut, which eliminates or reduces costly finishing operations. A disadvantage, however, is that the speed of cutting is slower and the initial heating period longer than with acetylene.

Methods have been evolved, therefore, to overcome this difficulty. The most popular is to enrich the coal gas with another gas having a much higher calorific value. In this way the amount of heat liberated by the flame is vastly increased, with a consequent substantial reduction in the time required to preheat the metal sufficiently to enable oxidation and the erosion effect of the high velocity oxygen to operate and make a "cut." The quality of the "cut" is comparable to that obtained when using coal gas.

The firm of Oxy-Ferrolene, Ltd., have specialized in this class of work for the last eight years. The plant consists essentially of a gas compressor, liquid "Ferrolene" storage tank, and a device for mixing the "Ferrolene" vapour with the coal gas. A back pressure valve is fitted to the inlet of the plant to avoid any possibility of interference with the town's gas supply. Coal gas, separately metered, passes through the back-pressure valve into a receiving chamber which communicates with the inlet of the compressor.

After compression, at any pressure up to 12 lb. per sq.in. according to requirements, the gas is stored in another chamber and then passes through the mixing device on its way by pipeline to the various appliances. A relief valve connecting the low and high pressure chambers ensures a steady predetermined outlet pressure thus maintaining constant conditions at the cutting machine gas control valves.

The plant is fully automatic in action, and as the mixture does not possess explosive tendencies, blowbacks are avoided and damage to nozzles eliminated.

By employing Ferrogas the speed of cutting is equal to that obtaining with acetylene, and at the same time, because of the "soft" nature of the flame, a very clean cut results. Where coal gas is used for profile cutting, the speed can be increased 15% by enriching with Ferrolene, with a similar saving in oxygen. In one particular instance, the oxygen saved regularly amounts to 30% of that previously used.

The saving in cost over generated and dissolved acetylene is approximately 75 and 80% respectively, and at the same time spent carbide disposal and handling of carbide or cylinders are avoided. Machines and torches using coal gas or acetylene can readily be converted to work on "Ferrogas" by replacing the standard jets with specially designed nozzles which give the maximum performance when operating on the enriched gas.

Most of the ferrous metals are best cut with an oxidizing pre-heating flame, but steels containing small quantities of chromium require a neutral flame. Where 4 to 6% chromium is present, however, a reducing flame is preferable or otherwise an infusible oxide is formed which seriously affects the starting of the cutting operation. The enriched gas flame is readily adaptable to suit all these requirements and so a comprehensive range of steels and cast iron is covered.

The Ferrogas method as an alternative to acetylene made from imported carbide, can also be applied to many other processes, such as billet dressing, descaling steel-castings, metal spraying, lead burning, brazing, copper and non-ferrous metal welding, local heating, hardening, &c.

The Annual Luncheon of the Institute of Fuel, at which Dr. E. W. Smith, C.B.E., will be installed as the incoming President, will be held at the Connaught Rooms, Great Queen Street, W.C. 2, on Thursday, Oct. 14, at 12.30 for 1 p.m. This Luncheon will be followed at 2.30 p.m. by the annual meeting of members at the same place, when Dr. E. S. Grumell, C.B.E., D.Sc., M.I.Min.E., the Melchett Medallist for the current year, will be presented with the Melchett Medal and will then give the Melchett Lecture, to be followed by Dr. E. W. Smith's Presidential Address. The Luncheon is open to all members and their friends, including ladies, at a charge of 12s. 6d. per head, inclusive of gratuities, but exclusive of wines, &c.

A Meeting of the Institute of Fuel, North-Eastern Section, will be held in the Central Station Hotel, Newcastle-on-Tyne, on Oct. 18, at 5.30 p.m., when Mr. J. G. Bennett, Director of the British Coal Utilization Research Association, will give an Address on "The Need for Industrial and Scientific Co-operation," which will be followed by a discussion.

Benzole Recovery by Active Carbon

By A. K. HOWELL,
Works Chemist, Manchester Gas Department

THE plant consists of four adsorbing vessels, with automatic valve gear, gas cooler, benzole condensers, separator, spirit tank and catch pot, together with re-circulating gas fan, water-circulating pump and water-cooling tower. The plant is entirely automatic in operation and needs only occasional supervision. There are three main processes—viz., adsorption, steaming, and drying and cooling.

The adsorption process is that in which the "rich" gas is passed from the outside to the inside of the annular ring through the specially-prepared carbon, when all the benzole and some 60–70% of the sulphur compounds in the gas are occluded by the carbon.

The steaming process.—After the adsorption cycle, all the gas valves to that individual adsorber close. The valve to the outlet gas main, in closing, opens the steam valve, admitting steam to the inside section of the adsorber—*i.e.*, in the opposite direction to the gas flow. The water vapour displaces the occluded benzole, the excess water vapour together with the benzole vapour passing through two condensers in series, where all the condensable vapours condense and flow to the separator. The uncondensable vapours pass into the adjacent adsorber, which is in the adsorbing stage. The benzole overflows from the separator into a measuring tank from which it is pumped into the storage tanks, while the water overflows into a catch pot, together with the condensate from steam traps, etc., and from there is pumped to the cooling tower.

Any benzole that may be carried into the catch pot overflows into a separate compartment, from which it can be pumped back into the separator.

The cooling or drying process.—At the conclusion of the steaming process the carbon is left in a hot, damp state and must be dried and cooled before it will efficiently adsorb more benzole. This is accomplished by re-circulating stripped, cooled gas through an indirect steam heater and then into the adsorbing vessel. The water in the carbon is picked up by the heated gas and the carbon cooled sufficiently to enable it to adsorb benzole again. The re-circulated gas passes through the gas cooler into the outlet main.

The break-point of the carbon—*i.e.*, when it commences to pass benzole—can be seen by observing the appearance of a flame on the outlet gas or by comparison of recording calorimeters on the inlet and outlet mains. When this occurs the valve gear can be adjusted to give a short cycle, until eventually the minimum cycle is reached, the carbon then being discharged and sent away for re-activation.

The automatic gas valves are shut by compressed air distending a rubber diaphragm, which pushes the valve in, and are opened by a spring (in compression when the valve is shut) which is allowed to expand when the air is released from the back of the diaphragm.

The compressed air is opened to and released from the diaphragms by piston valves, operated by cams ; the cam shaft being driven by the same motor that drives the air compressor.

The valves are so controlled that the various changes are synchronized.

Power requirements consist of two steam turbines, one driving the gas circulating fan and one the water-circulating pump; one steam-driven loading pump; four electric motors, two driving air compressors and valve gear, one driving the small pump for the condensed water and the fourth driving the fan blowing air up the cooling tower.

The waste steam from the turbines, with a small make up from the high pressure mains, is used for steaming out the adsorbing vessels.

COMPARISON BETWEEN OIL AND CARBON PLANTS.
RESULTS OF WORKING OF EACH PLANT.

	Oil plant.	Carbon plant.
Gallons benzole recovered per ton coal ...	1.67	3.93
Gas, cu.ft. " " ...	17,391	16,275
Gas, therms " " ...	78.26	73.89
Benzole therms " " ...	2.53	5.90
Total therms " " ...	80.79	79.79
Toluene in benzole	12—14%	9—10%
Sulphur in benzole	0.6—0.8%	1.1—1.2%
Sulphur extraction from gas (approx.) ...	20%	60%
Naphthalene " " " ...	100%	100%
Benzole " " ...	39%	90%
Benzole: distillation % at 100°C. ...	54	63
" " % at 160°C. ...	90	92
" Sp.gr. at 60°F.	.823	.808
Steam, per gallon of benzole	27—32 lb.	32—35 lb.
Water " "	46 gall.	—
Electricity " "	—	0.276 units.

A Meeting of the Institute of Fuel will be held on Sept. 30 at 5.30 p.m., in the Lecture Theatre of the Institution of Electrical Engineers, Savoy Place, W.C. 2, when Dr. R. Lessing will present a Paper entitled "The Rational Preparation of Coal," which will be followed by a discussion. Advance copies of the Paper (which will only be presented in summary at the meeting) can be obtained from the Secretary, the Institute of Fuel, 30, Bramham Gardens, S.W. 5, about ten days before the meeting. Members of the following Institutions are cordially invited to be present and take part in the discussion : The Institutions of Mechanical Engineers, Electrical Engineers, Mining Engineers, Gas Engineers, the Chemical Societies, the Institute of Marine Engineers, and the Coke Oven Managers' Association.

GAS PRODUCTS PRICES—STOCKS AND SHARES

The London Market Sept. 13.

All Coal Tar Products are in good demand, and Pitch in the London area remains about 45s.

An Order entitled The Control of Toluene (No. 3) Order, 1943 (S. R. & O. 1943, No. 976), came into force on July 20, and introduced certain changes in the prices for different grades of Toluene.

There are no changes to report in the prices of Coal Tar Products.

The Provinces Sept. 13.

The average prices of gas-works products during the week were: Pitch and Crude Tar,* Toluole, naked, North, 90's, 1s. 11d., pure, 2s. 7½d. (controlled by the Control of Toluene No. 3 Order, 1943, dated July 14, operative from July 20, 1943). Naphtha and Xylole controlled by the Coal Tar Naphtha and Xylole Order, 1943, dated May 31 (S. R. & O., 1943, No. 768), operative from June 1. Carbolic acid, 60's, naphthalene, and anthracene controlled by the Coal Tar Products Prices Order S. R. & O. 2509, dated Dec. 7, 1942, and operative from Jan. 1, 1943. Filtered heavy oil (min. gr. 1,080), 7½d. to 8d. Creosote oil has been generally controlled as to direction and price for some time past. Current value—fuel grades 5d. to 5¼d.; timber preservation and other purposes 4¾d. to 6d.

* In regard to pitch and crude tar prices we would ask readers to refer to the editorial note on p. 396 of the "JOURNAL" for Sept. 10, 1941.

Tar Products in Scotland Sept. 11.

Steady throughput is maintained. Refined tar controlled. Value is 4½d. per gallon *ex* Works, naked. Creosote oil: Specification oil, 6½d. to 7d.; low gravity, 7¼d. to 7½d.; neutral oil, 6d. to 6½d.; hydrogenation oil, 5⅞d. per gallon; all *ex* Works in bulk. Refined cresylic acid is active at 3s. 6d. to 4s. 6d. per gallon *ex* Works, naked, according to quality. Crude naphtha: 6½d. to 7d. per gallon. Solvent naphtha: Basic prices delivered in bulk, 90/160 grade 2s. 8d., and 90/190 Heavy naphtha, Unrectified, 1s. 10½d.; Rectified, 2s. 3d. per gallon. Pyridine: 90/160 grade, 13s., and 90/140 grade, 15s. per gallon.

Markets opened quietly last week, but the news of Italy's surrender caused sharp advances in some of the "post-war" securities. On Friday, however, the excitement died down, and the volume of business eased up somewhat and prices tended to droop.

There was a slight increase in the number of recorded transactions in the Gas Market, but again there were no special features. The few changes, with two exceptions, were in an upward direction, the principal movements occurring in Associated Gas and Water Undertakings ordinary and deferred stocks, both of which closed 1s. higher, while in the Supplementary List Tunbridge Wells sliding scale stock closed 3 points higher. Mid-Southern Utility "A" lost the 10 points gain of a week ago. At the Local Exchange Liverpool ordinary appreciated 2¼ points.

Among the few ordinary stocks on offer on the London Exchange is a parcel of £2,570 Bristol 5% maximum at 116 to yield £4 6s.%.

The following quotations were changed during the week:

OFFICIAL LIST		
Alliance & Dublin (*x.d.*)	98—103	Sept. 6
Associated Gas & Water Ord. ...	20/6—21/6	+1/-
Ditto Deferred...	20/6—21/6	+1/-
Gas Light & Coke 3½ p.c. Red. Pref.	94—97	−1
Ditto 3¼ p.c. Red. Deb. (*x.d.*) ...	95—98	Sept. 6
Imperial Continental Ord.	94—97	+2
SUPPLEMENTARY LIST		
Mid-Southern "A"	90—95	−10
Tunbridge Wells Sliding Scale ...	125—130	+3
PROVINCIAL EXCHANGES		
Hartlepool Ord.	88—90	+2
Liverpool Ord.	108½—109¼	+2¼
Newcastle Units	23/9—24/3	+-/6d.
Sheffield Cons. (*x.d.*)	136½—140½	Aug. 30

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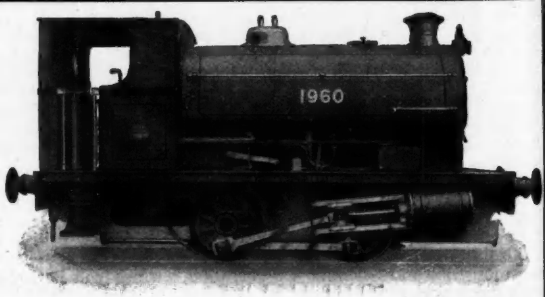
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